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THE COTTONTAIL RABBITS (*SYLVILAGUS
FLORIDANUS*) OF PENINSULAR FLORIDA

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When Nelson (1909) revised the rabbits of North America, he assigned all specimens of *Sylvilagus floridanus* from Florida to two subspecies: *Sylvilagus f. floridanus* (Allen) and *Sylvilagus f. mallurus* (Thomas). The former (type locality, Micco, Brevard Co., Florida) occurs throughout peninsular Florida from sea level to about the 100 foot contour, and occupies all of the southern portion of the peninsula, northward to St. Augustine on the east coast and to an unknown distance on the west coast. The northernmost locality of the west coast from which the subspecies *floridanus* has since been recorded is Gulf Hammock, Levy County (Pearson, 1954:479). *S. f. mallurus* (type locality, Raleigh, Wake Co., North Carolina) occupies west and north Florida, and extends southward onto the peninsula, in the interior, as far as Lake Julian, Polk Co. Later, Howell (1939:365) described *S. f. ammophilus* from Oak Lodge, opposite Micco, Brevard Co., Florida; the range of this subspecies is restricted to the offshore island or "peninsula" upon which the type locality lies. Hall (1951b:154) cited no new localities whence *S. f. ammophilus* has been recorded.

The three forms of *Sylvilagus floridanus* currently recognized as occurring in Florida may be briefly differentiated as follows: 1) *S. f. floridanus*—a small, dark, cottontail with short ears and proportionately large tympanic bullae; 2) *S. f. ammophilus*—similar in size to *S. f. floridanus*, but upper parts, sides, head, and ears paler (less blackish); 3) *S. f. mallurus*—larger than either *S. f. floridanus* or *S. f. ammophilus*, with upper parts less heavily washed with black than *S. f. floridanus*; darker than *S. f. ammophilus*; skull larger than that of either of the other two Floridian forms.

At the time of Nelson's revision, apparently there was but a single cottontail available for study from southeastern Florida; Nelson listed (*op. cit.*: 165) one specimen from Miami. Bangs (1898: 175) had pre-

viously recorded the occurrence of cottontails (as *Lepus (Sylvilagus) sylvaticus floridanus* Allen) from as far south as Miami. Field work conducted by the writer in southern Florida during the past seven years has shown that cottontails occur south of Miami along the lower east coast, and specimens have been collected as far south as the vicinity of Homestead, which lies 27 miles southwest of Miami.

Along the lower Florida east coast, cottontails have never been observed as being numerous. They inhabit the pine woods which occur to the east of the Everglades in this area; these open pine woods occur on the East Coast Ridge, an outcropping of oolitic limestone, raised above the level of the Everglades, and nowhere more than about 20 miles in width. To the north of Miami, this oolitic outcropping is replaced by sandy pinewoods, which extend as far north as about the latitude of Hobe Sound, Martin County. In some regions, these sandy pinewoods are replaced by rolling hills and sandy dunes which support growth of scrub oak and rosemary (*Ceratiola ericoides*), rather than the usual pines. The Everglades and their associated swamps and marshes border the pinewoods on the west, and thus a long tongue of sandy and rocky pineland extends from central Martin County south to southern Dade County, a distance of about 120 miles. This tongue of suitable habitat is limited on the east by the Atlantic Ocean, and on the west by the Everglades; the 'Glades are not inhabited by cottontails, but are rather the principal region in southern Florida occupied by the marsh rabbit, *Sylvilagus p. paludicola*. The only area of contact between the cottontails which inhabit this eastern isolated tongue of pineland and the cottontails farther to the north lies in southern Martin County. Under these circumstances, it is not surprising that study of recently collected material from southern Florida as well as additional specimens from farther north in the state shows that the cottontails inhabiting the lower Florida east coast represent a recognizable and unnamed subspecies of *S. floridanus*.

I wish to thank the following curators for allowing me to examine pertinent material in their collections: William H. Burt (Museum of Zoology, University of Michigan), Charles O. Handley, Jr. (United States National Museum), Miss Barbara Lawrence (Museum of Comparative Zoology), James N. Layne (University of Florida), and Oscar T. Owre (University of Miami). In addition, I have examined specimens in the collection of the Charleston Museum and my own collection. L. Neil Bell, Edwin L. Blitch, George P. O'Malley, Dennis R. Paulson, John R. Porter, and Raymond P. Porter have given me much assistance in collecting cottontails throughout Florida, and their help is hereby gratefully acknowledged.

All measurements are in millimeters and all capitalized color names are from Ridgway (1912). Skull measurements were taken in the manner of Nelson (*op. cit.*) as clarified by Hall (1951a: 47). Zygomatic breadth was taken as the widest measurement of the posterior third of the zygomatic arch. In some specimens, the ventral shelf at the anterior root of the zygoma is well developed and the arch is wider at this point. However, for the sake of consistency and comparable measurements, the posterior zygomatic breadth only was taken and employed in the present paper.

The cottontails of the lower Florida east coast, which I name after Dennis R. Paulson of Miami, Florida, may be known as

Sylvilagus floridanus paulsoni, subsp. nov.

Holotype.—Charleston Museum 56.14, an adult female, skin and skull, taken 6 miles north of Homestead, Dade County, Florida, by George P. O'Malley, February 6, 1951. Original number 1718.

Diagnosis.—A small member of the *Sylvilagus floridanus* complex of races, smaller than the three remaining subspecies (*floridanus*, *ammophilus*, *mallurus*) inhabiting Florida. Measurements of total length, tail and hind foot average smaller than those of the remaining Floridian subspecies. Cranially, averaging smaller in all measurements except interorbital breadth, and especially in measurements of zygomatic breadth, and length of upper molar tooth row. Dorsum pale, less washed with black than *floridanus* or *mallurus*, and sides more gray than in these two forms. Compared with *ammophilus*, *paulsoni* grayer on sides, less washed with black on rump, and dorsal coloration less bright.

Distribution.—Lower Florida east coast, from Palm Beach County south to Dade County.

Description of holotype.—External measurements: total length, 370; tail, 45; hind foot, 85; ear from notch, 60. Cranial measurements: greatest length, 68.8; basilar length, 53.8; zygomatic breadth, 33.4; length of nasals, 26.8; width of nasals, 13.3; interorbital breadth, 17.4; breadth of braincase, 26.0; length of upper molar tooth row, 12.6; diameter of tympanic bulla, 11.0. At time of collection, the type was lactating, and also contained two fetuses, each measuring 67 mm. in total length.

Coloration, (in winter pelage) Avellaneous dorsally, relatively lightly (as compared with *floridanus* and *mallurus*) overlaid with black. Sides Tilleul-Buff, mixed with black, and sharply delimited from the white venter. Side patches Vinaceous-Buff; crown and nape patch Cinnamon. Front feet Light Pinkish Cinnamon, grading to Cinnamon on the upper arm. Hind feet white, grading quickly to Light Pinkish Cinnamon on the upper leg. Soles of front and hind feet Pinkish Buff. Ventrally, throat Pinkish Buff; lateral patch Light Pinkish Cinnamon. Rump Vinaceous-Buff, intermixed with black. Ears slightly edged with blackish on the anterior margins. Tail white ventrally, Pinkish Buff mixed with black dorsally.

Variation.—Ten adults from Dade and Brevard counties, Florida, resemble the type in their pale coloration. Only one of these specimens is in winter pelage and this individual resembles the type in coloration. The remaining nine specimens all show some degree of wear, but are distinctly paler than specimens of *floridanus* and *mallurus* in comparable worn pelage. The tendency for worn pelage to lose some of the buffy tints has been pointed out by Nelson (*op. cit.*: 162), and specimens of *paulsoni* in worn pelage show that the dorsal buffy area fades considerably and in some individuals is almost indistinguishable from the color of the sides, blending imperceptibly into the paler lateral coloration.

Comparisons.—Comparison of *S. f. paulsoni* with the three remaining subspecies of cottontail in Florida reveals the following. *S. f. paulsoni* can be easily distinguished from the races *floridanus* and *mallurus* by its distinctly paler dorsal coloration; the central buffy area on the dorsum

is not only paler in coloration (Cinnamon in topotypes of *floridanus* and in South Carolina specimens of *mallurus*) but also in the reduction of black hairs overlying the buffy areas of the dorsum. Thus, the dorsum of *floridanus* and *mallurus* is not only brighter in coloration but also darker due to the heavy wash of black. From *S. f. ammophilus*, *paulsoni* differs in having the rump less heavily overlaid with blackish hairs. The dorsal coloration of these two races is quite similar, although *ammophilus* seems somewhat brighter (Pinkish Cinnamon) in fresh pelage. Howell (*loc. cit.*) differentiated *ammophilus* from *floridanus* on the basis of upper parts, sides, head, and ears paler (less blackish), and the nape patch being a paler shade of tawny. These characters will separate *ammophilus* from *floridanus* without difficulty, but the resemblance in coloration between *ammophilus* and *paulsoni* is very close. The similarity between *ammophilus* and *paulsoni* may well be due to the similar habitat which both occupy. The xeric sandy and rocky soils of the East Coast Ridge and the sandy soil of the off-shore island which *paulsoni* and *ammophilus* inhabit respectively have probably brought about the paler coloration of these two populations through selective mechanisms, and the resemblance between the two subspecies thus expresses convergence due to similar habitat rather than close genetic relationship. It is interesting to note that the type locality of *S. f. floridanus* lies on the mainland opposite Oak Lodge, the type locality of *ammophilus*, and from localities farther south on the Florida mainland, rabbits showing the dark coloration of *floridanus* have been examined.

Cranially, *S. f. paulsoni* averages smaller in all measurements taken (see Table 1) except interorbital breadth. The skulls of *S. f. mallurus* are noticeably larger and more robust than are those of *floridanus*, *paulsoni*, and *ammophilus*. Comparison of the cranial measurements of *ammophilus*, given by Howell in the original description of that form, with those of *paulsoni* in Table 1, show that the latter averages smaller than *ammophilus* except in breadth of braincase, which is narrower in *ammophilus*. It should be noted that, when series of these four subspecies are compared, the differences between the cranial measurements of such externally different and recognizable subspecies as *mallurus* and *floridanus* are relatively slight. The differences between cranial measurements of *paulsoni* and the remaining Floridian subspecies are of the same degree as those separating other subspecies of *Sylvilagus floridanus* in the southeast.

Remarks.—Intergradation between *S. f. floridanus* and *S. f. paulsoni* is demonstrated by two specimens from Palm Beach County, Florida. Both are in fresh pelage, and both are intermediate in dorsal coloration between *paulsoni* and *floridanus*, although closer to the latter form in the heavy wash of black over the dorsal buffy area. One of these specimens is a skin without skull. The other (an adult female) has long ears (67 mm.) characteristic of *floridanus*, and on the basis of skull measurements, can be placed with either subspecies with equal propriety. In the list of specimens examined, these two individuals have been called *floridanus*, although they are considered intermediate between this subspecies and *paulsoni*.

Examination of additional material from Florida allows for clarification of the ranges of the other forms of *S. floridanus* in the state. A single specimen without skull from the south end of Merritt Island,

Table 1. External and cranial measurements (means and observed ranges) of three subspecies of *Sylvilagus floridanus*.

	<i>S. f. mallurus</i> (14 ♂, 10 ♀)	<i>S. f. floridanus</i> (20 ♂, 9 ♀, 1 ♀)	<i>S. f. paulsoni</i> (4 ♂, 7 ♀)
Total length	424 (367-465)	414 (355-485)	397 (370-424)
Tail	50 (40-70)	49 (37-70)	44 (32-51)
Hind foot	95 (84-103)	89 (75-95)	87 (80-93)
Ear from notch	63 (57-66)	59 (55-78)	60 (56-62)
Greatest length	74.1 (67.2-80.0)	72.5 (68.9-75.9)	70.7 (68.8-75.8)
Basilar length	56.2 (47.0-60.8)	55.3 (51.9-58.1)	53.5 (52.4-55.9)
Zygomatic breadth	36.1 (35.1-37.2)	38.8 (33.0-37.5)	34.2 (32.9-35.3)
Length of nasals	31.3 (28.7-34.4)	30.3 (28.2-32.7)	29.1 (26.8-32.9)
Width of nasals	15.2 (13.0-17.8)	14.2 (12.3-15.9)	14.1 (12.9-15.4)
Interorbital breadth	18.0 (16.5-20.2)	17.1 (15.4-19.2)	17.4 (16.4-18.5)
Breadth of braincase	28.1 (26.4-29.3)	26.2 (22.2-27.8)	26.0 (25.6-26.8)
Upper molar tooth row	14.4 (13.0-16.2)	14.0 (12.4-15.1)	13.6 (12.6-15.1)
Diameter of tympanic bulla	11.7 (10.8-12.5)	11.3 (9.4-12.5)	11.1 (10.2-11.8)

Brevard County, Florida, is assignable to the subspecies *floridanus* rather than *ammophilus* on the basis of its heavy wash of black over the dorsal buffy area. It might be expected that this island would be inhabited by *S. f. ammophilus*, which occurs on the next adjacent island to the south and east, but this does not appear to be the case.

Pearson (*loc. cit.*) reported the occurrence of *S. f. floridanus* at Gulf Hammock, Levy County, Florida. I have examined four adult specimens from Gulf Hammock, and these individuals are definitely assignable to *mallurus* rather than the nominate form. They can be easily distinguished from *floridanus* by their large size; in fact, the skulls of the Gulf Hammock series are larger than most specimens of *mallurus* from South Carolina, Georgia, and interior Florida. The presence of *S. f. mallurus* at Gulf Hammock clarifies the ranges of *mallurus* and *floridanus* along the Florida west coast. The northwesternmost station of occurrence of *floridanus* has previously been reported as Blitches Ferry, Citrus County, (Nelson, *op. cit.*: 165) whereas *mallurus* has been reported only from Gainesville in the north central section of Florida. The occurrence of *mallurus* at Gulf Hammock indicates that this subspecies occurs approximately as far south as the Withlacoochee River on the Florida Gulf Coast, and *floridanus* apparently occurs to the south of this river in Citrus County.

Specimens examined.—*Sylvilagus f. mallurus*. North Carolina, Macon Co., 1.1 mi. SE Highlands, 1. South Carolina, Oconee Co., 1.6 mi. N. Salem, 1; McCormick Co., 2 mi. NE McCormick, 2; Georgetown Co., 12 mi. S Georgetown, Kinloch Plantation, 1; Berkeley Co., 1 mi. N Cainhoy, 1; Otranto, 1; Charleston Co., St. Andrews Parish, 2; Wadmalaw Island, 1; 4.1 mi. W Charleston, 1; John's Island, 1. Georgia, Chatham Co., Barnwell Island, 2. Florida, Alachua Co., Gainesville, 11; Levy Co., Gulf Hammock, 5; 2 mi. NW Janney, 1; Lake Co., Leesburg, 1.

Sylvilagus f. ammophilus. Florida, Brevard Co., 9.5 mi. S Indialantic, 4; 11 mi. S Indialantic, 1; 11.8 mi. S Indialantic, 1; 12 mi. S Indialantic, 1.

Sylvilagus f. floridanus. Florida, Putnam Co., Welaka Reserve, Welaka, 4; Polk Co., Crooked Lake, 1; Brevard Co., Mico, 8; Merritt Island, 1; Osecola Co., Camp Hammock, 4; Charlotte Co., 3¼ mi. SW Punta Gorda, 2; 6 mi. S Punta Gorda, 1; Englewood, 1; Pinellas Co., Tarpon Springs, 1; Glades Co., 10 mi. N Moorehaven, 5; 6 mi. S, 1 mi. E Moorehaven, 1; Collier Co., Immokalee, 2; Naples, 1; Palm Beach Co., Lake Worth, 1; Lantana Road and Military Trail, 1.

Sylvilagus f. paulsoni. Florida, Broward Co., Ft. Lauderdale, 3; Dade Co., Miami, 6; Coral Gables, 1; Hialeah, 1; 6 mi. W Perrine, 1; 6 mi. N Homestead, 1 (holotype); 7.3 mi. N Homestead, 1; 8 mi. N Homestead, 1; 9 mi. N Homestead, 1.

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